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Magnetic field induced irreversibility in specific heat of UNiAl

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Results of low-T specific-heat (C) measurements of UNiAl single crystal in magnetic fields $B \leq 14$ T will be presented. UNiAl is an itinerant 5f-electron antiferromagnet ($T_{\rm N} \approx 19$ K) that is reflected in a reduced U moment and a high $\gamma \approx 165$ mJ/molK^2. Owing to huge uniaxial magnetocrystalline anisotropy, the only field influence on magnetic contributions to C and other electronic properties is observed if the field is applied along the c-axis of the hexagonal structure. At $T < 8$ K, UNiAl undergoes a first-order metamagnetic transition for ($B_{\rm c} \approx 11.4$ T) between the AF state and a high-field ferromagnetic ordering of U moments. In this T range the C vs. T curves measured in $B = 0$ T are different depending on magnetic history. The C values for the ZFC sample are between 2 and 7.8 K higher than for a sample that has appeared in the high-field state prior to measurement. The field induced irreversibility is clearly evidenced on the C vs. B data obtained at 3 K. For a measurement cycle (starting from ZFC state) 0 T $\rightarrow$ 14 T $\rightarrow$ 0 T the "ascending field" ($C^{\rm af}$) and "descending field" ($C^{\rm df}$) data below 9 T clearly differ and $C^{\rm af} > C^{\rm df}$. In both cases we observe (for $B < 9$ T) a $C = C_0 + aB^2$ dependence with different C_0 and a values in each case. The results will be discussed in the context of other electronic properties reported for UNiAl before and neutron scattering results reported elsewhere at this conference.